

SYSTEMS AND METHODS FOR ESTIMATING HELIUM  
PRODUCTION IN SHROUDS OF NUCLEAR REACTORS

ABSTRACT OF THE DISCLOSURE

[0059] A method for estimating a helium content of the stainless steel core shroud in a boiling water nuclear reactor includes, in an exemplary embodiment, determining a neutron fluence for predetermined areas of the reactor, and estimating a helium content of the stainless steel shroud at predetermined areas of the reactor using the following equation:  $C_{He} = 1031 * (1 - e^{-b_j * \phi_j})$ , where  $C_{He}$  is the helium concentration as atomic parts per billion of helium in the stainless steel shroud per weight parts per million of boron in the stainless steel shroud,  $b_j$  is a value between about  $2.50e^{-21}$  and about  $5.00e^{-21}$ ,  $\phi_j$  is fluence expressed as neutrons per square centimeter, and subscript  $j$  denotes thermal fluence or fast fluence.